WHAT MAKES A LITERACY?

Journal of the American Association of School Librarians

VOLUME 44, NO. 5 | May/June 2016 | ISSN 1094-9046 | www.ala.org/aasl

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The world in which we live is not the world into which we were born, nor is it the world we will see in ten years. It is changing and expanding at a phenomenal rate. As I sit here and ponder the literacies and skills necessary for current and future generations to not only survive, but to thrive and be successful, I’m blown away by how quickly change occurs. Not only have we watched the needs of our students change, but so, too, have our school library programs grown and changed with them. As school librarians, we are among the leaders and change agents for our communities. We must ensure that our programs are growing to meet the ever-changing needs of our students. How do we make sure that our school library programs contribute effectively to preparing young people for a complex and nearly unforeseeable future?

After being in education for any length of time, we begin to see patterns and cycles emerge. I began working as a school librarian in 1992, just one month after my 22nd birthday. Now, after decades in the field, I continue to feel that evolving with the profession is rewarding. I find it energizing to keep up with the changes in my student population and their needs as learners, independent thinkers, and active citizens. Recently, in my travels as AASL President, I was asked how I am able to do everything I do as a school librarian. This question gave rise to an epiphany: I’ve recognized that it takes about a decade to make fundamental, long-range, and sustainable change. Facilitating change begins with training and programming for students and staff to alter thinking, learning, and best practice. As I work with my community, sometimes we achieve only baby steps; other times change seems to move by leaps and bounds. Though the rate of change often varies over the course of implementing something new, by the tenth year the attention to detail and nurturing are revealed as having been worthwhile as the change has become institutionalized, embedded, and intuitive within the culture and habits of the school.

Years seem like a long time, but when thinking of systemic change affecting hundreds or thousands of students, staff, and parents, the time scale makes sense. According to research on forming a new habit, it takes an average of sixty-six days of focused attention for an individual to foster and form a new habit, and it takes even more time and attention to break a bad habit (Lally et al. 2010). That is sixty-six days of focused attention by a person already intrinsically motivated to make the change. Changing a whole community is much more difficult!

Change in education has to start by getting understanding and buy-in from administration and faculty. This understanding and buy-in move in waves toward the students, until finally the change trickles toward families and the wider community. Change often starts small so as not to overwhelm or intimidate. Combine these requirements with all the other issues and factors that demand educators’ focused attention and time, and it is no surprise to find that real institutional change takes years.

And, of course, fostering a global and sweeping change to progress toward the future is not the only thing a school librarian is doing for her community as she continues...
to manage all other professional responsibilities as well. Patience, dedication, vision, and excellent organizing skills are essential!

Once a big idea has been nurtured until it has grown and become embedded and institutionalized, the school librarian then focuses energies toward major change on the next big educational idea. Looking back, I can see the professional focus for environmental change in my school culture for the first decade was collaboration and inquiry, for the second decade it was developing a culture of readers and socializing reading, and now in this decade the emphasis has been on participatory learning (like the makerspace movement) and digital literacies. All these foci are important elements of the school library program, but the degree of emphasis on each changes and evolves based on the needs of the students.

Change is an important part of a thriving school library program. Looking back just ten years, what did your library look like? What might your library look like ten years from now? How will education have transformed? What support will the school library program need to be prepared to offer to best serve students, staff, and administration? What skills will be taught in an intentional manner? What will critical learning consist of? How do we prepare ourselves to teach and support the literacies students might need for a future that is difficult to anticipate? What traits in us and in our students will be most important in the future?

Despite many uncertainties, we know that supporting the next generation’s development into self-regulated and autodidactic learners will be critical. Self-regulated learners are successful in school and in their careers because they have internalized personal, behavioral, and environmental strategies for organizing, interpreting, and evaluating their learning as well as for seeking and developing a learning support network. When self-regulation traits are fostered, students can then progress toward becoming autodidactic learners, with crucial skills, strategies, and dispositions that they, in turn, will be able to pass along to later generations. Remaining digitally literate for their lifetimes will require generations of self-directed, self-motivated, self-taught learners driven to think, create, share, and grow.

Our professional home for school librarians, AASL, has always been progressive and on the forefront of envisioning the future and implementing standards and guidelines that prepare school librarians and young people for the world in which they will live. When examining AASL’s Standards for the 21st-Century Learner (released in 2007), we realize that the standards were quite advanced and forward-thinking. The expectations for deep thinking and learning evidenced in the Common Core State Standards, released in 2009 and adopted by many states, were already embedded in AASL’s national learning standards published two years before the CCSS.

Looking ahead to the next ten years, AASL is again at the forefront of innovation and change. As school librarians we are futurists and visionaries. Our new national standards, set for release in the fall of 2017, will exemplify our talent for foreseeing the experiences and traits the next generations will need so that they will have the skills and confidence to navigate through and thrive in the global information-rich, interactive world of the future. For more information on the standards revision project visit <www.al.org/aasl/standards-guidelines/revision>.

One of the things I love most about school library programs is that they are flexible and adaptive. School libraries are incubators for constant evolution and change. We, as school librarians, have to be ready to lead that change and be ready for our programs to grow and evolve. We can’t wait for change to happen to us, but rather we need to chart a course for programs, resources, and learning—formal and informal—to meet the ever-changing needs of our students.

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Work Cited:
Do you remember what the pages of a book looked like before you could read? We remember they seemed impenetrable and garbled. Learning to read is learning to make sense out of that obscure collection of markings. Now, imagine trying to make sense of a complex graph plotting years of data across a range of economic variables. Perhaps such a graph would give you pause even today—as it likely would your students. But, with purposeful practice, they can become as fluent in decoding and extracting meaning from this system of communication as they are with text.

The term literacy, which we traditionally use to describe the ability to read and write text, is proliferating across library and other educational literature. Concerns about financial literacy, digital literacy, and civic literacy help shape the programming offered by our colleagues in public libraries. It can be dizzying to consider the array of literacies and try to understand how they fit productively into our own school library programs. To tease out the underlying commonalities of all these literacies and begin to integrate them into a meaningful whole, we wanted to investigate: What makes a literacy?

Ultimately, each type of literacy facilitates sense-making within a certain field. Sense-making, the process we use to construct understanding, includes developing enough background knowledge to interpret and make judgments; it allows us to notice patterns and discrepancies, so we can make connections among diverse ideas. New literacies enter the lexicon as we recognize our students are struggling with sense-making in new contexts.

Perhaps we agree that these emerging skill sets are important, but you may still be asking: Is it the role of the school librarian to take on these challenges? School librarians’ traditional practice includes supporting literacy development throughout the educational process and teaching research and information skills. This issue will demonstrate that this expertise uniquely positions us to support students in honing skills in other literacies.

Priscille Dando opens our discussion, laying out the basic skills we can build into early literacy instruction through interactive read-alouds. She highlights particular elements that will serve our students as they develop a range of literacies: self-monitoring for comprehension, connecting to prior knowledge, asking and answering challenging questions. The kinds of questions the school librarian asks as she guides young readers to think and connect with a story provide a model for sense-making across multiple literacies.

Increasingly, we notice that the ability to ask good questions is a significant concern among our school library colleagues. Sara Kelley-Mudie and Jeanie Phillips present for your consideration the literacy of questioning and strategies for helping students learn to generate effective questions. They contend that capable
questioning isn’t about knowing the answer, but about knowing how to approach the question and developing a sense of what a right answer would look like.

Source quality, privacy, and information ethics are also deeply held concerns of our profession, but how do we equip students in these areas as we teach them to use data as evidence? Kristin Fontichiaro and Jo Angela Oehrli help librarians break down the concept of data literacy into manageable pieces, laying out the areas where our professional expertise sets librarians up to have a positive impact on student outcomes.

As school librarians, we help students evaluate content in various formats. Students work with visual materials as both content consumers and content creators. Karyn N. Silverman and Joy Piedmont share concrete examples from their visual literacy curriculum, showing how they build a foundation in constructing visual presentations, helping students develop skills that they apply to school work across disciplines.

Nora Murphy puts her finger on a particular challenge that often stymies student researchers. Their limited exposure to the sheer variety of information sources constitutes a kind of source illiteracy. She argues that before students can evaluate content for quality and appropriateness to their information needs, they must first understand the nature of the source itself. Nora identifies ways we can foster development of source literacy in our students. Her metaphorical frame of “frog literacy” provides a fresh perspective on student research.

Can building a better understanding of the lexicon, concepts, and values of the disciplines help school librarians gain leverage with content-area teachers and inspire collaboration? Meredith Cranston, Sue Smith, and Lauri Vaughan take on the challenging but rewarding task of examining the overlap between information literacies and the disciplinary literacies that guide much of teachers’ practice in the classroom. The authors propose that disciplinary literacies provide librarians with an avenue to better integrate our school library programs with classroom instruction while helping students navigate the potentially conflicting expectations of multiple disciplines.

This issue also features articles addressing related topics. “Technolibrarian” Carolyn Foote considers how school librarians can reduce students’ “library anxiety” and foster the digital literacies needed for college and workforce readiness. Elementary librarian Mary Catherine Coleman explores an innovative application of Design Thinking practices in early literacy instruction. Her approach could be viewed as a creative application of the techniques Pricille Dando advocates for earlier in the issue.

In this issue’s online exclusive article, Katie Day, head of libraries at United World College of South East Asia–East Campus in Singapore, uses the perspective of her position to raise the question of global literacy. What knowledge, mindsets, and skills does it take to be a global citizen?

But with all these literacies (and more!) potentially falling under the school librarian’s purview, how is a school librarian to get anything done? Annie Schutte wraps up our discussion of literacies, leading us through a process for examining our own programs, prioritizing objectives, and working with classroom teachers to craft a coherent curricular arc.

As partners in support of research instruction, we have long highlighted the necessity of critical thinking. We push students to frame better questions, investigate the source of information, and synthesize information from multiple sources to, ultimately, form a judgment and communicate their conclusions. These habits of mind will serve students well as they strive to become data-conversant, globally minded, and digitally savvy. What is a literacy? It is at the core of what school librarians do.

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Traditional Literacy and Critical Thinking

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School librarians are well positioned for making significant contributions to reading development by focusing on the integration of critical thinking and traditional literacy. The interactive read-aloud is a key strategy.

A significant challenge for today’s educators is a pivot in the common understanding of best practices for teaching and learning. School librarians should welcome this shift away from the “student as vessel” model of teaching to a more constructivist model intent upon developing critical-thinking skills that enable students to make their own meaning for deeper understandings (Rainie 2014).

In the No Child Left Behind era, teachers focused on ensuring students acquired a body of discrete skills and knowledge. Contemporary pedagogies embrace the idea that discrete skills and knowledge act as critical building blocks for success, but the ultimate goal is to prepare students for a lifetime of learning.

How students show what they can do with that knowledge and how they demonstrate application of learning processes in real-world situations are the best indicators of their future success.

School libraries reflect this change in thinking; Joan Frye Williams’s analogy frames libraries as no longer being grocery stores stocked with ingredients but kitchens where ingredients are combined to create something new (Valenza 2008). As traditional hierarchical models of learning transition to inquiry models grounded in critical thinking, application, and performance, teaching and learning through the lens of literacies is an approach that makes sense for school library programs.

Literacy and School Libraries
Since their inception, libraries have been associated with literacy. But what is literacy? In the traditional sense it is the acquisition and practice of reading and writing. Consider the new literacies that are explored in this issue, and the definition can be expanded to an applied understanding and performance in a system or environment of practice. The literate practitioner must have the ability to decode and create within a defined context. Literacy development under this definition targets proficiency in areas of functional understanding, communication, and culture.

Traditional literacy and information literacy have been the school library’s instructional bread and butter for generations. Including new literacies such as data literacy, global literacy, and visual literacy among others provides frameworks for instruction that encompass students’ real-world experiences and prepare them for success in the future. How school librarians focus on activating critical thinking through traditional literacy development can proactively set the stage for the deep thinking that occurs in all literacy development.

Traditional Literacy and the School Librarian
The school librarian’s role in traditional literacy development is as critical as ever. At the elementary level, a balanced literacy approach integrates explicit teaching such as guided reading and word study with read-alouds and shared reading. While teaching of reading and writing skills may commonly be considered the classroom teacher’s domain, limited time in a school day may prevent a classroom teacher from providing read-aloud experiences as often as needed. The school library is where the mechanics of literacy are put into practice.

The library provides ready access to reading across platforms. Books—in print and online—magazines, websites, and apps are the playground for engagement with text and graphics. Additionally, in
the school library students have opportunities to engage in reading and writing through a variety of activities, including, of course, read-alouds. Read-alouds have long been a staple of elementary library visits but how and why read-alouds are conducted make a tremendous difference in the literacy development of students. Fully literate students seamlessly navigate the system of words and meaning as an integrated whole, and then connect what they’ve read with their own thoughts, opinions, and experiences to create new understandings. Bottom line: It’s the thinking that matters. School librarians are well positioned for making significant contributions to reading development by focusing on the integration of critical thinking and traditional literacy. The interactive read-aloud is a key strategy.

Why Interactive Read-Alouds?

Students should be practicing what real readers do—construct personal meaning from their reading. Interactive read-alouds enable students to hone their thinking skills with their school librarian before they have the fluency to do so independently. Librarians often are terrific storytellers who read picture books with animation and enthusiasm. Asking comprehension questions and prompting the audience to make predictions is standard practice to engage students. However, the interactive read-aloud is a specific and planned strategy that ignites curiosity and ensures that all students activate critical-thinking skills. Research shows interactive read-alouds as part of a balanced literacy approach increase comprehension, support students’ content background knowledge, boost vocabulary, and assist in development of independent reading and writing of similar texts (Cummins and Stallmeyer-Gerard 2011).

A significant benefit of interactive read-alouds is how they encourage students to think actively before, during, and after reading. When students engage in a meaningful conversation about a book’s ideas and presentation, they are empowered to articulate connections and make their thinking visible to others (Hilden and Jones 2013). Students require direct instruction in how to integrate with their prior knowledge what they are hearing, seeing, and reading. The conversation must go beyond recall to exploring the “big ideas” in a fiction or nonfiction text and making meaning for themselves (Cummins and Stallmeyer-Gerard 2011). These conversations can bring great pleasure to the reading experience, not unlike the discussions readers enjoy in book clubs. The ultimate outcome is that students’ enthusiasm for engaging in higher-level thinking leads to accomplished independent reading and benefits student learning across disciplines.

Planning for Interactive Read-Alouds

Katherine Hilden and Jennifer Jones provide guidance in crafting an experience for students that will activate deeper learning. Two fundamental aspects to keep in mind:

1. An interactive experience takes planning. It is more than a straight read through followed by a few improvised questions.

2. Questions are open-ended. The reader does not share her opinion or imply that an answer is right or wrong. The focus is on the students’ thinking.

(Cummins and Stallmeyer-Gerard 2011)
Interactive read-alouds should serve a specific purpose—not every book can be effectively used this way. Collaborate with classroom teachers to choose titles that make connections to students’ learning and life experiences. Consider titles that are accessible but challenging enough to offer new vocabulary or ideas. Imagine how a particular book will engage students. It should be a rich experience that compels students to interact. How can they make connections with prior knowledge? Classroom content? How curious will they be in exploring the structure, visuals, and big ideas of the story (2013)?

Purposeful Observations and Questions Bring a High Return in Engagement

At the core of an interactive read-aloud is the prompting and questioning of the reader. To begin a session, the reader should plan an opening. For example, offering listeners a connection to a previous text, an invitation to examine an aspect of the illustrations or story structure, or a description of the genre all help focus attention and anticipate the reading (Fountas and Pinnell 2006, 226). Readers never ask a question that they already know the answer to. As the reader, ask interpretive questions rather than factual. One way to know that questions will activate thinking is to assess whether they are focused on big ideas rather than on details of the text.

Questions that connect beyond the text are more likely to require thinking and still reveal students’ comprehension. Prompt students to consider important information in different contexts or to speculate why the author and illustrator made certain choices. When students offer answers, be sure to dig deeper. Why do they think what they do?

What can they point to in the text or pictures that supports their ideas? Ask students what they are wondering. “Can anyone expand on this idea or present a different point of view?” One way to ensure everyone is interacting is to match students with partners so they can “buzz” about their thoughts before sharing with the larger group (Hilden and Jones 2013).

Assessing and Extending Learning

Extend student thinking after the read-aloud by providing time for reflection. The reading-writing connection is vital to literacy development, but students can also use multi-modal forms of expression (Hilden and Jones 2013). Drawing or recording audio or video reflections offers an effective way to assess students’ understanding and critical thinking. When collaborating with the teacher about the read-aloud, it may make sense to have the reflection take place in the classroom so that the teacher can engage with the experience as well, help students make additional connections, and manage time effectively.

Gateway to a World of Literacies

The critical-thinking skills students build while becoming accomplished readers and writers provide the foundation for learning in a variety of environments. This Knowledge Quest issue explores student engagement in understanding and using data and graphics, cultivating global and visual literacies, and applying inquiry processes—all of which require skills in observation, questioning, and making connections, skills that evolve through traditional literacy development. The school librarian’s role in ensuring students master skills essential for success in their future academic and real-life experiences begins with supporting their development of critical thinking as learners work toward proficiency in traditional literacy tasks.

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Works Cited:


GOOD QUESTIONS—DEEP QUESTIONS—ARE LAUNCHING POINTS FOR CRITICAL THINKING. QUESTIONS, NOT ANSWERS, PUSH US TO THINK CRITICALLY.

What Makes Questioning a Literacy?

Literacies are how we make sense of the world; we read to gain knowledge, and we write to share new understandings. Asking and answering questions is also how we make sense of the world. It’s why young children ask so many questions—there’s a lot to make sense of and patterns about the world to discover. And yet, as children age they ask fewer questions. The Right Question Institute finds that as children’s reading and writing skills improve, the number of questions they ask decreases, and, unfortunately, as the rate of questioning diminishes, so does the rate of engagement (Berger 2014, 44–45). It is our belief that teaching students to become fluent questioners also increases their engagement in learning.

When we think of someone who is literate we think of a person who can read and write—someone who can do only one or the other is not fully literate. To be question-literate a person must be able to both construct and understand questions. To construct a question students need to know what the parts of a question are and how to put those parts together to ensure that the question is asking for the answer they’re looking for. Just as students need to learn the alphabet and develop phonemic awareness, they also need to learn different question words and how expert vocabulary and concepts are incorporated into questions. Understanding a question is different from answering a question; it means being able to form an idea of what an answer might look like and what type of information is being sought. Knowing how to go about answering a question is an important skill, and the first step in that process is understanding the question that’s been asked. As with any literacy, students need regular practice to develop questioning fluency and to learn how to comprehend and analyze questions.

To become question-fluent, students must understand how different types of questions operate. They need to practice asking and answering various types of questions so they can understand how different question lenses change the type of question being asked and the type of answer being sought—for example, “Which form of transitional justice is most effective?” versus “How does a society decide which form of transitional justice to use?”

Just as letters can make different sounds in different contexts, different types of questions serve different purposes depending on their context. “Which form of transitional justice is most effective?” requires a different type of inquiry when discussing transitional justice in general versus the narrower and more detailed inquiry that can be conducted when a specific case is being examined.

How Are Questioning and Critical Thinking Related?

Critical thinking is high-level thinking that requires us to analyze, evaluate, synthesize, or apply what we know. Its relationship with questioning is cyclical. Good questions—deep questions—are launching points for critical thinking. Questions, not answers, push us to think critically. As the cycle continues, critical thinking leads to more nuanced questions. Questioning and critical thinking work together to further engagement, curiosity, thinking, and learning. As Richard W. Paul and Linda Elder have stated: “To think through or rethink anything, one must ask questions that stimulate our thought” (1999, 8). Answers are stopping points. Only when another question is asked can thought move forward.

Metaphors are often used by proponents of questioning, for example: questions are engines that drive thinking; questions are tools that help us dig deep into knowledge. We propose a rock-climbing metaphor: questions are the foot- and handholds that help learners climb to new heights in their understanding.

Authentic questions are crucial for cultivating both the motivation and curiosity needed to scale those heights. As Ian Leslie said in
Curious, “Asking good questions stimulates the hunger to know more by opening up exciting new known unknowns” (2014, 103). A recent study reported in Neuron concluded that curiosity positively affects memory and information retention (Gruber, Gelman, and Ranganath 2014). But curiosity does more than just aid knowledge acquisition; it moves thinking forward by closing knowledge gaps.

George Loewenstein, psychologist and behavioral economist from Carnegie Mellon University, has described curiosity as a “response to an information gap” (Leslie 2014, 34). To feel curious, to ask good questions, we must become aware of our own ignorance. It is that awareness that enables us to ask questions that will build our knowledge. If we return to our rock-climbing metaphor, questions allow us to scale great heights by providing leverage points. They scaffold a learning journey, chunking it into pieces small enough to traverse but challenging enough to keep the learner interested. The beauty of student-generated questions is that they are individualized; each student determines her or his own path up the cliff face. While some may be prepared for a greater degree of difficulty, others may need to set a less-challenging course. When students become literate in the art of questioning, they have the tools they need for lifelong learning; they can set a course that guides and extends their thinking.

What Do We Ask Questions About?

Students who lack background knowledge can find inquiry-driven learning challenging. At first, their questions may focus on minutia of assignments’ due dates and requirements. (We’ve all encoun-}


tered students who want to know what the source requirements are before they’ve even decided on a research focus.) It’s difficult to start asking questions before you have some context for what you’re asking about; if you’ve never seen the sky, you don’t ask why the sky is blue. A range of different strategies can pique students’ curiosity, but one of my (Sara’s) favorites is the write around. I am deeply indebted to Buffy Hamilton for introducing me to write rounds and the work of Harvey “Smokey” Daniels and Elaine Daniels. Write rounds can take a number of forms, but the one I use most often when working with students to develop a research focus is text on text. Text-on-text write rounds involve my laying out several passages of text and/or images on a large piece of chart paper (see figure 1) and students’ collaboratively annotating the texts by quietly writing on the text and chart paper.

Figure 1. Students collaborating during a write around.
I recently used this strategy with a class doing research on literature related to the winter holidays. The collaborating teacher and I sought passages that would help shift students’ perspectives around familiar stories; if you know why the sky is blue, and suddenly the sky is green, you have new questions! I have found this process especially useful in scaffolding the question-development process for students when paired with some of the strategies Ron Ritchhart, Mark Church, and Karin Morrison wrote about in *Making Thinking Visible* (2011). These strategies can expose gaps in understanding and provoke questions that will lead to further inquiry.

Carol Kuhlthau’s Information Search Process provides excellent guidance for the right times to intervene and provide some structured questioning for students—when to help students find a handhold on the cliff. Students who have hit a point of frustration and are asking “What do I research?” are at a point where they need questions asked of them, and they need scaffolded support for developing a research question.¹

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¹ If you aren’t familiar with Carol Collier Kuhlthau’s work, we recommend exploring her website at <https://comminfo.rutgers.edu/~kuhlthau/information_search_process.htm>.

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How Do We Foster Questioning in Students?

The first thing we can do to foster questioning is to make space for students’ questions. We can go a long way toward helping all students become literate questioners by giving them opportunities to ask questions and using those questions as springboards for learning.

The Question Formulation Technique (QFT) is another way to develop students’ questioning skills. Designed by Dan Rothstein and Luz Santana of the Right Question Institute, this process provides structure as students ask questions, analyze their questions, refine, revise and prioritize their questions (see sidebar and figure 3). It is not enough just to have students pose questions, they also need to examine them critically (see figure 4). It is in the analysis and iteration of questions that the best questions emerge and that students develop their question skills. The QFT includes time for reflection on the process, encouraging students to think about their thinking and how it might apply to future learning.

For students who need help getting started with forming questions, it can be helpful to provide a list of question starts, such as “How would it be different if...?” and “What is the purpose of...?”. Scaffolding the question-asking process helps students develop fluency and confidence in asking questions and in understanding the questions asked of them. See our list of further resources for other strategies for scaffolding student questions.

The question-development process provides many opportunities for giving formative feedback while modeling questioning strategies. We can ask students why they think a particular question is useful or important, and what type of information they think they might find based on that question. Similarly, we can model our own questioning process when working with students and teachers by “questioning aloud” as we plan a lesson or a search strategy.

Sometimes student research is independent, but collaborative.
questioning can still be helpful. Students can be given time to develop their initial knowledge and questions on their topics through pre-search. They then present their findings to a small group, ending with a question of interest. Classmates listen and take notes, jotting down questions on sticky notes. Questions are shared with the presenter who then organizes and categorizes them, analyzing and revising them until a focus question emerges for research. This is a powerful tool both for practicing question skills and developing a better research question.

Regardless of how we help students ask, analyze, and revise questions, it is crucial that these questions lead to something more. Student questions can be used in many ways:

• as research questions to guide inquiry,
• for formative or summative assessments,
• as focuses for reading texts,
• as tools for problem solving,
• as driving questions for project-based learning, or
• as questions for Socratic Circles or Harkness Discussions.

Students will always need to be able to ask—and answer—good questions. By working with students to build better questions, we ensure that they will always be able to answer the question: “What do I want to know next?”

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Further Reading:
WHY DATA LITERACY MATTERS

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Introduction

From their first research project, students notice numbers. From how many toes a polar bear has to the percentage of Americans who own iPhones, student researchers sense instinctively that numeric data is a powerful way of communicating information. Even though students often believe numbers convey an air of authority in their work, their lack of critical awareness is undermining their success.

As many states move forward with adoption or adaptation of the College, Career, and Civic Life (C3) Framework for Social Studies State Standards, Common Core State Standards, and/or Next Generation Science Standards, students are expected to be fluent with data: to collect and analyze it, create figures and tables, integrate quantitative information, and move fluidly between text and visually represented numerical information.

Despite these formal expectations, students receive little guidance on how to move nimbly between text and numbers beyond what examples they see in textbooks or instructions for in-class controlled lab experiments. There is a disconnect between classwork and the data and statistical literacy skills needed beyond the classroom. Whether researching cancer statistics or the best car to buy, students don’t often have a strong sense of what those numbers mean. Students often believe that numbers are objective, though data in the real world is rarely so. In fact, visualized data—even from authoritative sources—can sometimes be anything but. School librarians increasingly recognize that students either make poor decisions about the quality of statistics, data, and visualizations, or that they lack the ability to comprehend these resources altogether.

School librarians can play a significant role in helping students gain understanding of real-world numbers, statistics, charts, graphs, and visualizations. Librarians are unique cross-disciplinary pollinators who can fill the gaps between subject areas and help students gain skill in comprehending and critically evaluating data at home, at school, and in life. We collectively refer to these skills as data literacy and define data as:

1. Information represented numerically via raw numbers, percentages, percentiles, averages (mean, median, mode), etc.
2. Information that can be used algorithmically to determine compatibility (OKCupid), fitness levels (Fitbit), personality (BuzzFeed quizzes), etc.
3. Numerical information rendered visually (charts, graphs, coded maps, tables, etc.) to aid in pattern-finding and comprehension. (Fontichiaro and Abilock 2015)

Michael Bowen and Anthony Bartley wrote, “Data literacy is important for your students [...] because data are used to argue and persuade people to, among other things, vote for political agendas [...] or lease a car. An improved understanding of data practices means that better questions can be asked” (2014, ix) and better decisions made.

To build students’ capacity as thoughtful, active citizens in this brave new world, we must first build our own data literacy capacity. Given limited time and access to students, we must distill and prioritize data skills, building out our toolkits with mini-lessons and high-leverage data literacy rules of thumb that bridge the gap between awareness and action.

How Do You Eat an Elephant? One Bite at a Time

Few librarians received formal instruction in statistics. Anecdotal evidence points to a profession dominated by humanities and social science majors with little collegiate practice in data and statistics. On our campus, no school library candidates since 2010 have had STEM (science, technology, engineering, math) backgrounds, and we imagine the situation is similar elsewhere. Few library schools incorporate data or statistical literacy into information literacy courses, and few school library programs require coursework in research methods, where statistical literacy would be a core learning objective. If you are among the few who are well-versed in data and statistics, we salute you. Everyone else, keep reading—we see a terrific opportunity ahead for librarians.

Tackling self-study in data and statistical literacy can be a challenge. In our new IMLS-funded project to develop data literacy as a subset of information literacy skills, we have concentrated on how students read, comprehend, evaluate, and synthesize data and not on how they create and organize data via lab experiments. In doing so, we have identified six significant themes for school librarians to consider.

One: Statistical Literacy

Statistics flood news articles, Facebook feeds, and scholarly journals. School librarians and their students must critically “read,” contextualize, and interpret raw
School librarians can play a significant role in helping students gain understanding of real-world numbers, statistics, charts, graphs, and visualizations. Librarians are unique cross-disciplinary pollinators who can fill the gaps between subject areas and help students gain skill in comprehending and critically evaluating data at home, at school, and in life.
and synthesized data. Discerning correlation from causation; recognizing the difference in the meaning of mean, median, and mode; understanding what margin of error signifies in polling data; and recognizing potential biases in collected data, among other skills, are critical for reading scholarly research, understanding arguments in popular media, and interpreting government documents. For example, MyFitnessPal released a list of the ten healthiest and least healthy states (MyFitnessPal Staff 2015). A savvy librarian asks, “How did they gather the data?” and discovers that the list was determined based only on MyFitnessPal users. She then recognizes that those users might not be representative of all residents.

Two: Data Visualization

Having skills to create and comprehend mapped data, graphs, pie charts, and emerging forms of visualizations will help students effectively navigate visually rich information sets. At a session at the 2015 Research Relevance Conference, librarians shared their concerns that the emotional overtones (e.g., color, icons) used in these visualizations have powerful influence over students. One critical question posed in the conversation that our project will address was, “Which comes first? Learning how to make graphics? Or how to interpret them?” Additionally, the need for data visualization skills across library types was evident at the 2015 American Library Association Annual Conference, where approximately 150 librarians gathered for a two-part data visualization session, the conference’s only session on data literacy.

Three: Data in Argument

Our students can assemble random bits of factual data. However, it takes far more skill to understand how data is used—both informationally and persuasively—to support arguments in resources students examine, and then for students to create viable arguments themselves. These arguments could take the form of statistics embedded as evidence in a research paper, shared charts and graphs with tweaked or nonstandardized elements, advertising, or infographics.

Infographics have emerged in many schools as a novel way for students to represent what they have learned, yet many school librarians with whom we spoke expressed dissatisfaction with students’ work, stating that it too often contained disconnected facts and lacked a cohesive argument. Similarly, a 2013 survey indicated that citizens in the UK overlooked statistics that would correct their misconceptions on topics like the rates of teen pregnancy and crime (Ipsos MORI 2013).

Four: Big Data and Citizen Science

Recent media reports lament society’s “Big Data Problem” (Kopytoff 2014; Pena Gangadharan 2014; and Salmon 2014). More and more data is being collected, often without citizens’ knowledge, via frequent-shopper cards, step counters, social media, and more. Some data is life-saving, such as DIY systems that help parents monitor their children’s Type 1 diabetes by transferring insulin data temporarily and anonymously online (Nightscout Project 2015). Careful human interpretation of big data is required for positive outcomes to be achieved.

One student-friendly entry point for interacting with big data is citizen science. Students should recognize that projects like eBird and the emerging PhotosynQ invite the crowd-sourcing of data for the greater good (monitoring birds’ locations and migration, and tracking photosynthesis levels in leaves, respectively) but must incorporate mechanisms to address data authenticity and accuracy. However, students must also realize that some data-collection projects start out with good intentions—such as the failed inBloom initiative to passively monitor identifiable student data and achievement for decades—but backfire by making too much personal data vulnerable to outside access. Microsoft researcher danah boyd has called for more understanding of data and statistical literacy as tools to navigate these issues (Pearle 2015; Hardy 2012).

Five: Personal Data Management

From Google’s personalized search results to Facebook’s custom ads, students have daily experiences—often unbeknownst to them—captured as their clicks and likes are converted into actionable data. While students might like seeing relevant ads or music recommendations that match their favorites, few know it is because of the breadcrumb trail they leave behind. Students may think the website CNN.com is serving up the news to them, but they are usually unaware that as many as fourteen bots are following their actions and converting their clicks into data, according to a recent experiment conducted with Google Chrome extension Ghostery, which monitors webpages for beacons, advertising, and click-counting tools.
School librarians have long taught digital citizenship and the importance of being cautious about personal information shared online. As students use the open Web for research, they need to be aware that even if they do not enter their names or phone numbers online, information about them—their search habits, their choices of which webpages to visit—may be attaching themselves to their Internet cookies or Google account. Librarians must extend their credibility lessons to help students recognize that today’s online content creators and social networks are engaged in a balancing act between maximizing advertising revenues and delivering quality content. This nuanced understanding goes beyond more-obvious credibility markers such as relevance, authorship, or currency into a recognition that information online is a market-driven economy—and editorial choices may be influenced accordingly.

**Six: Ethical Data Use**

Data is not inherently good or bad, but it can be framed, edited, manipulated, or otherwise modified for unethical purposes (such as swaying voters by citing a small or outdated study)—or simply to confuse (Is "take an additional 25% off our half-off prices" the same as 75% off?). Just as students need practice in rhetoric and information literacy, students also need practice learning to create and evaluate data-related arguments and information. This may seem like a minor extension of
existing practice. We already tell our students to use information accurately and to cite sources. Is using data accurately and citing it any different? We believe that there is a difference because of students’ inherent belief that numbers are infallible. We must train our brains—and theirs—to remember to stop and analyze numerical arguments, not just text-based ones. Ethical informational use is more than merely citing sources. In fact, we can leverage discussions about ethical use of personal data—something of deep personal value—to ground discussions of citation, an abstract concept the value of which can be more difficult for teens to grasp.

**Librarian Action Steps**

For us, data literacy has been an acquired taste, and we suspect the same may be true for you. Kristin’s interest grew from Debbie Abilock’s gentle but persistent prodding that the big data movement was something to watch. At the University of Michigan Library, Angie currently chairs the data information literacy task force, which focuses on exploring existing data literacy teaching strategies as well as creating new teaching practices in this area. She has been working for several years on initiatives to develop her colleagues’ understanding of data literacy. We have found these books and resources to be helpful:


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**Jo Angela (Angie) Oehrli** is coprincipal investigator for the Supporting Librarians in Adding Data Literacy Skills to Information Literacy Instruction project. A former teacher in an alternative high school and in middle schools, Angie works as an instructional librarian and has coauthored a chapter on the University of Michigan (U–M) librarians’ data education professional development project for The New Information Literacy Instruction (Rowman and Littlefield 2015). At U–M she collaborates on instructional strategies with diverse groups, including the campus Women in Science and Engineering Residence Program. As the former chair of the University of Michigan Library Instructor College, she led the professional development efforts for U–M librarians in the area of instruction. She co-created the Michigan Instruction Exchange, a low-cost, statewide conference for instruction librarians. She is an adjunct lecturer in the University of Michigan School of Information, focusing on instructional practices for librarians and information professionals, and teaches both basic and advanced digital research methods courses for the U–M College of Literature, Sciences, and the Arts. She has also chaired the Top Twenty Committee for ALA’s Library Instruction Round Table and currently serves on the LOEX Advisory Council.
A welcoming overview of data and statistics by an advisor to our project.

Provides user-friendly context for understanding statistics in the real world. Definitely not a stats class textbook!

A superb introduction to data visualization analysis and construction. Remarkably user-friendly. Yau also publishes the flowingdata.com blog.

Conclusion
Data is more than charts, graphs, and spreadsheets. It is being used in powerful, sometimes nearly invisible, ways to shape how we view the world and our role within it. In a world where everyone is an author online, data use is at the crux of teens’ daily lives. Never has there been a more critical time to declare data as an essential literacy for students. Is it ethical for someone’s social media profile to be used as evidence against them? Should someone’s Fitbit data be used to contradict her testimony? It already has been (Hambright 2015). Should algorithms predicting future crimes be used to sentence someone now? They already are (Barry-Jester, Casselman, and Goldstein 2015). Should neighborhood data be used to determine mortgage eligibility and rates, despite the legal ban on “red-lining”? It already is (Knott 2015). Do schools and libraries have a responsibility to help future generations figure this out? Our answer is that we unequivocally do.

These are the questions that affect all of our students. As part of our IMLS-funded grant, we will be publishing professional development materials for school librarians and other educators, as well as conducting virtual conferences in summer 2016 and 2017, focusing first on statistical literacy, data in argument, and data visualization, with the remaining themes scheduled for development in the final year. We invite you to view our progress and join our e-mail notification list at <http://dataliteracy.si.umich.edu>.

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FEATURE

STUDENT AS CITIZEN:

Sarah Jane Levin
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TEACHING CRITICAL LITERACY SKILLS THE LIBRARY
As a school librarian, one of my goals is to teach students to become responsible citizens who recognize a sense of purpose and place in the larger community. Many schools, including my own, have core values that reflect a desire for our students to develop a broad community mission and purpose, often through programs with thoughtful curricula, including service-learning, identity work, and social justice. Students are pushed to “engage with community rather than perform a service on a community” (Argenal and Jacquez 2015). In this article, I’ll define civic literacy for educators, examine the need for such a literacy to be woven into the library curriculum, and describe an eleventh-grade service-learning research project that promotes critical civic literacy at the Urban School of San Francisco (Urban).

What Is Critical Civic Literacy?

A literacy can be described simply as an awareness or knowledge in a specific subject area. Literacies, especially critical civic literacy, are not typically inherent skills and must be taught and acquired. Having civic literacy “means being well-versed in social and political knowledge, understandings, dispositions, and skills” (Teitelbaum 2010), while having a critical civic literacy goes even further:

Critical civic literacy, a cornerstone of a democratic society, is the ability to name, analyze, and act on a social or political issue. Students who have developed critical civic literacy skills will understand how to be informed citizens, participate in and initiate societal change, as well as identify their own core values and connect them with the broader community. At Urban, the students are “driven by inquiry, action, and reflection, which ultimately promotes democratic participation” (Argenal and Jacquez 2015).

At the heart of critical civic literacy is the notion that students must be taught to question the constructs and categories offered in schools, the media, and dominant cultural groups. Critical civic literacy rejects the notion that knowledge can be directly transmitted from curriculum to teacher, from teacher to student in politically neutral, encapsulated forms. Rather, a critical approach to civic literacy insists that students become active participants in constructing their own knowledge and worldviews and use education as a tool to interrogate and confront the forces that both shape and limit their lives. (Leahey 2011)

Critical civic literacy defies the clicktivism and slacktivism that have recently entered the nomenclature of politics and media. Critical civic literacy requires students to engage actively and authentically with both media and historical context. “A critical civic literacy perspective allows students to closely interrogate historical and current events, allowing them to focus on ways that they can participate in the process of creating positive changes toward the ultimate goal of promoting social justice” (Mayo 2011).

How Can Critical Civic Literacy Be Fostered?

Promoting social justice is at the core of the service-learning program at Urban. Students begin their critical civic literacy work as freshmen with projects focused on aspects of their own identity. As sophomores they learn to recognize their own values and then apply those values to a civic issue. In eleventh grade students choose an issue to investigate and use library sources to conduct their research. The research is intended to support understanding of the topic from the student’s own viewpoint along with others’ viewpoints. Students use books and databases to find viewpoints and articles, but also find and manipulate government and NGO (non-governmental organization) statistics, conduct and seek out interviews, and use other primary sources to create a robust annotated bibliography. Since the research is not applied to a traditional paper or other written product-driven assignment, the work is focused on finding quality sources that have meaning for the student. Students demonstrate understanding by presenting the results of their research as mini-lessons to their classmates.

By the time students at Urban are in the eleventh grade, they’ve been challenged by a robust critical service-learning and social-justice curriculum. Students explore their own identities and values in ninth- and tenth-grade service-learning courses. In small groups they also work with a community organization. The eleventh-grade course, Service Learning Independent Internship and Seminar: Identity at Urban and Beyond, meets in two seminar classes each week, engaging students “to arrive at new understandings of identity, social constructs, and the influences they have on their experiences” (Argenal and Jacquez 2015).
During the rest of the week, students work independently off-campus with community organizations. The course culminates in student presentations of mini-lessons on social issues they’ve spent the term exploring through research and practice. This project, along with the entire four-year service-learning curriculum, enables students to put their critical civic literacy skills into action.

While civic literacy can be used in conjunction with a robust service-learning program such as the one at Urban, the principles of civic literacy can be woven into many disciplines. In Urban’s statistics course, for instance, students are encouraged to use data that tackles a civic issue of interest to them. The students learn how to find datasets on the open Web and in library databases and then to interpret data. Visual art classes at Urban also scratch the surface of critical civic literacy by engaging students with art as activism as well as art as a social practice.

Creative collaborations between school librarians and teachers in the sciences and world languages could also incorporate critical civic literacy in a bigger research project.

The school library can also promote civic literacy through cocurricular means. At Urban we create pertinent book displays connecting our collection to local, national, and global current events (see figure 1). Displays sometimes reflect a micro-level of current events within our school, supporting assembly speakers and club events. The library also creates mobile checkout stations at school-wide events, most notably during Multi-Culti Week (a celebration of our multicultural affinity groups) and Month of Understanding (featuring speakers and events that promote diversity and cultural competency). This outreach connects our cocurricular and academic programs and encourages intrinsic curiosity. These library materials focused around topics of current interest directly draw in students and faculty.

School librarians can play a unique role in helping students develop the skills and motivation to seek out and engage in service-learning projects. We can help students develop critical civic literacy skills—skills that help our citizen students recognize how to enhance service work and become agents of change in a democratic society. We can also integrate critical civic literacy skills throughout the curriculum to enhance our students’ understanding of their place in the local and global communities.

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Works Cited:


READING THE BIG PICTURE

A Visual Literacy Curriculum for Today

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In schools around the country, students are increasingly asked to create visual representations of ideas and information. Slideshows, infographics, and websites have become nearly as common as text documents. We spend years teaching students grammar and paragraph construction so that they can become strong written communicators, but rarely is the same attention spent on the elements of visual communication. Many educators assume that students "just know" how to create visual material; at fault is the myth of the digital native, the pervasive idea that comfort with typing, tapping, and swiping correlates to knowledge or skills. Our students communicate daily in an environment with rapidly changing norms; we must create opportunities for explicitly teaching, learning, and practicing elements of visual communication—critical life skills.

Let’s step back and define what, exactly, is meant by "visual literacy." Looking at the AASL learning standards, specifically 1.1.6 and 2.1.6 (AASL 2007), and the ISTE publication Media Literacy in the K–12 Classroom (Baker 2012), we see that visual literacy can be defined as reading and writing in (or through) pictures. In our school critically decoding the meaning of images is often addressed in arts and humanities classes. The school librarians teach a course that focuses on creation—the "writing" aspect of visual literacy. The use of visuals to communicate requires extensive education and support, yet is rarely covered elsewhere in the curriculum. We take a broad view of visual literacy, encompassing text elements in presentations and infographics that integrate with, support, and are supported by the visual elements. In the end, our focus is on communication, which is often multimodal; images, text, even audio and video should all be considered part of the larger context of visual literacy.

Teaching visual literacy is two-pronged. One component is purely mechanical; there are tools that students need to master to cement their developing visual literacy. This aspect of instruction is akin to teaching handwriting or typing in traditional literacy education. The other component is the conceptual framework that determines whether the visually encoded information is clear and comprehensible as well as aesthetically pleasing.
Our goal is to help them understand that the meaning is always there, whether effective or not, and that they, too, can create meaning by harnessing the power of visual communication.

We have spent several years teaching the concepts of visual literacy as part of a ninth-grade foundational course, and have found that for secondary students who come from disparate backgrounds (as many as twenty separate schools), establishing a strong conceptual foundation is critical. Frontloading the mechanics would make the curriculum focus on the tools rather than the content and lead to proficient tool users who still lack vital communication skills.

We come at this as librarians, not designers. We have not been formally trained in design; we strive to be thoughtful consumers of visual information, and we’ve read widely over the years (see the resources listed at the end of the article). We are not teaching a course on graphic design, although that’s a piece of our instruction, but on graphic decoding and encoding. Our students don’t realize that they decode visual information all the time. The seams don’t show in the best design; even students alert to the communicative power of images can miss the subtler impact of visual messaging. Our goal is to help them understand that the meaning is always there, whether effective or not, and that they, too, can create meaning by harnessing the power of visual communication.

Despite all the jokes about PowerPoint, slideshows are still prevalent and relevant communication tools. They are simple, with a relatively low bar to entry; they work for presentations across a range of topics and for both synchronous and asynchronous communication. We’ve seen that the average high school student is responsible for several slideshows each year, giving them multiple opportunities to practice and consolidate the skills we teach.

With slight modification, these skills are transferable to other forms of visual communication.

We begin by giving our students the opportunity to purposefully decode visual meaning in a slideshow built for the class. The slides are deliberately poorly designed, and students are asked to critique them. Based on prior experiences, many students have already developed an aversion to poor color choices, distracting fonts, or improperly resized images. As they find the flaws and critique the design in front of them, students begin to see that they already possess the ability to identify elements of design, though they lack the technical vocabulary or framework for discussion.

The next step is for students to flip that skill, to go from knowing what contributes to bad design to understanding how to
create good design. We continue to use a slideshow to convey the principles, but these slides have been carefully constructed to embody the elements of good design. We take learners through the building blocks of graphic design: color, font, layout, and image selection. The slideshow consistently demonstrates and reinforces the ideas so that when students critique they can see what works; they are also encouraged to note aspects of the design that still aren’t as effective as they could be.

Finally, the students practice designing with clear communication as their aim. With limited class time we aren’t able to ask them to create a full slideshow, so we focus on making one excellent slide that is presented to and critiqued by their peers. This limitation has, in fact, turned out to be a benefit for the students. Intense focus on one slide gives students the opportunity to practice thoughtful design, a skill that they scale up as they are asked to make full slideshows throughout their high school careers.

Students frequently come back to the school library for support whenever they have a presentation due. They can justify their design choices and identify when they are failing to communicate effectively. By senior year, many of them don’t need support at all.

Our results are anecdotal, but again and again, this is the strand of our curriculum that is mentioned by our returning graduates. Our students feel their communication and visual literacy skills give them an advantage in college. Everyone they meet knows how to write, but not everyone can convey meaning with their visuals.

Teens regularly share images on Snapchat, Instagram, and Tumblr and use emojis and GIFs to communicate with each other. They’re interacting with visuals every day; our goal in teaching visual literacy is to teach young people to think critically about the design that’s all around them. AASL’s learning standards and the Common Core State Standards point repeatedly to the need for clear, effective communication. In school and at play, students need communication skills that move beyond text. Learning to use design for communication gives students practical, necessary tools for success.
Karyn N. Silverman is the high school librarian and Educational Technology Department chair at LREI (Little Red School House and Elisabeth Irwin High School) in New York. A member of AASL, she is a Kirkus reviewer and blogs at <http://blogs.slj.com/printzblog>.

Joy Piedmont is the high school technology integrator at LREI (Little Red School House and Elisabeth Irwin High School) in New York. She is currently the president of the Hudson Valley Library Association, a regional association of independent school librarians. She is a School Library Journal reviewer and blogs at <blogs.slj.com/printzblog>.

Recommended Reading:

Works Cited:
An Argument for Disciplinary Information Literacy

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Teachers become experts in their discipline and its writing conventions after years of study. However, we ask students who switch subjects five or six times a day to change disciplinary lenses every hour or so. We can imagine students’ feeling baffled: Why is an author’s nationality or temporal context so important in history but hardly rates a mention in science? Why can nothing be said definitively about *The Great Gatsby* but authoritative claims can be made about proof of the Pythagorean Theorem?

As an alternative to the established approach of integrating generalized information literacy skills into projects and papers, consider an appeal directly to teachers’ expertise so that students can develop skills within the framework of subject-specific content. As Timothy Shanahan and Cynthia Shanahan have explained, disciplinary literacy recognizes that “disciplines differ extensively in their fundamental purposes, specialized genres, symbolic artifacts, traditions of communication, evaluation standards of quality and precision, and use of language” (2012, 11). William G. Brozo and colleagues explained: “Unlike the outside-in approach of generic content reading, disciplinary literacy evolves from the inside out because the text itself and the goals for reading the text dictate the reading process” (2013, 354).

In other words, rather than asking all teachers to take responsibility for teaching their students the same reading and information literacy skills, ask content specialists to focus on disciplinary literacy and teach reading in the manner their disciplines demand.

A recent discussion with high school history teachers about what they had to “unteach” their students was revealing. They mentioned the propensity of students to include direct quotations in their writing; historians prefer summarizing or paraphrasing to efficiently incorporate secondary sources in an essay. The history teachers also mentioned that their students put too much emphasis on transitions between ideas, felt unnecessarily compelled to attach their discussion of a past event to a contemporary issue, and often took great liberties with their interpretation of events. These are the same skills English teachers strive to cultivate among young writers discussing literature. It is no wonder students, even conscientious students, are confused.

Applying Shanahan and Shanahan’s definition of disciplinary literacy to information literacy requires development of skills beyond the ability to simply read and write; it requires a broader definition of literacy. Information literacy depends on abilities to search, identify, evaluate, parse, and effectively re-communicate information. It implies a broad level of fluency in confronting, handling, and communicating information in all its mediums, a set of skills we might refer to as disciplinary information literacy. The student who is disciplinarily information literate is able to access, identify, evaluate, parse, and effectively re-communicate information in a manner appropriate to a given discipline.

Reframing our collaborations around disciplinary information literacy is not an unreasonable goal. Making our students explicitly aware of the differences between researching and writing in history versus English or science will help students code-switch as they move, physically and mentally, from discipline to discipline throughout their school day and assignments. With this...
method, in collaborating with our colleagues, we can help learners become sophisticated participants in the scholarly conversation.

What might this look like in practice? Imagine how you might support a science teacher frustrated with her students’ attention to sensationalized scientific research on television news. Propose a lesson for young dramatists about why the latest James Bond film was a box office hit but panned by critics. Use nerd jokes: What do World History students need to know to find Queen Elizabeth’s nominating the Spanish Armada for the ice bucket challenge funny?

Such an approach gets at the very essence of individual disciplines and appeals to a teacher’s subject expertise. Disciplinary information literacy encourages the cultivation of an understanding of how information is handled by experts in the discipline and asks students to assume the mantle of scholars, adopting the practices of mathematicians, journalists, playwrights, scientists, and poets. Student perspectives that are legitimized and positively reinforced through practice will only get better and more refined. Teachers see the bigger picture when they intentionally teach students how to use information like a historian (or scientist or artist or mathematician) rather than attempting a piecemeal attack on a specific information literacy skill. Discipline-driven projects are by their very nature more organic and better aligned with authentic inquiry. Most surprising of all, discipline-driven information literacy projects also tend to be interdisciplinary. Academia may divide up the world into specific subject areas, but real life does not.
APPROACHING SOURCE ILLITERACY, OR HOW A SOURCE IS LIKE A FROG

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What Is Source Literacy?
When a kid gets ready to dissect a frog, she understands certain basics about the frog itself—that it’s dead, that her older brother dissected one, that this is what happens in biology class. She doesn’t know everything there is to know about a frog, but she has a framework for placing the frog in the context of her educational life. She is frog literate in a sense; she knows where frogs fit into her world, how they relate to school, to ponds, to lily pads. Keeping that in mind, consider that a frog is to dissection as a source is to research. When a student is presented with a source, what framework does she have for identifying its role in her research? Has she seen it before? Does she know where it originates, how it relates to other sources, and whether it belongs in her pool of potential sources? Is she source literate? For most of our students, the answer is probably no, at least not yet.

If being literate means possessing a competency or a body of knowledge that allows one to access, process, and further his or her own learning in a certain area, then being source literate means knowing about sources and source types, how they are named, how they are produced, by whom, why, and how they interact with other sources. This knowledge stands apart from source selection and evaluation, both of which depend on source literacy, just as selecting a mystery novel depends on knowing how to read the words themselves. The key is thinking about that frog. Source literacy isn’t defined by what you do with the source once you’ve selected it, but instead what you understand about the source in the first place. It’s about scrolling past the Huffington Post because you know what it is and that it’s not the kind of source you need. It’s knowing the Onion is satirical, or that Charlie Rose is considered a more serious interviewer than Kelly Ripa, or intuiting that Wired probably has something to do with tech, just based on the name. Knowing these things impacts the moment just before selection and evaluation begins; in the blink of an eye, one’s level of fluency in terms of source literacy determines how one proceeds when conducting research, formal or informal.

Just as fluency isn’t knowing every word in a language, source literacy isn’t knowing every source. It is, instead, the ability to interpret from context, to know what to ask, to read the clues, and to use the understanding brought from knowing about other sources. A person fluent in source literacy is able to do this automatically, the way you are reading the words on this page or the way you know a frog is a frog. You know about Charlie Rose and the Onion because you are source literate, which you have probably become through experience rather than instruction. You are source literate because you know things and can do things, but mostly because you know things. So, who taught you? If the answer is no one, then you begin to see the problem.

Why Do Students Need Source Literacy?
Students can find relevant content, but they often select material that is not suitably challenging for their academic development. There’s a flash of evaluation that, for a fluent researcher, comes before the examination of the content of the source, the credibility of the author, or the relevance to the topic. It’s the moment in which one considers whether the source itself indicates a degree of likelihood that anything within the source will be useful. The student conducting the frog dissection doesn’t begin to evaluate the contents of the frog until she has recognized that it is a frog. If she were presented with a cat or a worm, she would know the difference both in terms of its place in the world and in her approach to it.

The cycle of finding and evaluating is where source literacy lives; it is a cycle that, for so many of our students, is endless and dizzying. With increased fluency, that process becomes less explicit and more intuitive, freeing the intellectual and emotional space necessary for high-level analysis.

How Can We Help Students Develop Source Literacy?

Guide Students as They Develop a Digital Source Bank
Source illiteracy is a major obstacle to our students’ success as researchers, but because source literacy is usually gained through experience and not instruction, each student’s source literacy depends on factors generally outside of our control. When I consider how my own source literacy developed, I realize that it was an entirely unsystematic process. I found out what things were only as I encountered them. Short of giving students a list of source types with examples and telling them to memorize it, what do we do to take source literacy from the realm of random experience to that of deliberate instruction? We design planned learning experiences that require students to interact with the source types on that list, and, ideally, multiple examples of each type. In other words, to bombard learners, slowly, with sources. The key is taking a tacit and opportunistic approach and making it systematic and explicit.

Imagine having students create a digital source bank. We often...
presume that they are creating a mental source bank as they learn new research skills, but again, making this process explicit is where students will benefit most. As they complete carefully designed assignments in different content areas, they record sources and source types they’ve encountered along the way. Perhaps such a source bank would resemble a Pinterest page with boards for different types of sources (or topics, academic disciplines, concepts), which, in turn, include websites, magazines, newspapers, archives, museums, or podcasts with attached annotations articulating what each is and how it is useful. Imagine this becoming a reference source (not to mention a portfolio product) that students use as a starting point for research and a guide to recalling prior knowledge. Seeing an article published by the Atlantic on a list of search results would soon become an exercise in which students consider the Atlantic itself as part of their selection process, leading them to eventually understand what kinds of content the Atlantic is likely to publish and then returning to it when they have an information need that this periodical is suited to address. This is a useful refinement of the “find and evaluate” cycle, and one that comes to source-literate researchers quite naturally.

**Give Students Feedback on Their Source Banks**

A digital source bank gives tangible form to something that is now, for most of our students, intangible and implied. It also gives us the opportunity to formatively assess the development of source literacy using a tool other than a bibliography, which is normally summative and represents a different set of skills than the ones described here. A bibliography tells us what items the student has selected and examined, but instead what you understand about the source in the first place.
but not necessarily what she knows about the actual publications or source types. Additionally, using a source bank acknowledges that every source is useful for something and that there is value in knowing those uses; evaluating a bibliography requires us to do the reverse as we explain why some sources are not useful for the defined purpose. Drawing on a pool of known sources based on a specific information need requires critical thinking that is different from sifting through a pool of sources to reject those that are not useful.

What Are the Benefits of This Approach?
By their junior or senior year, source-literate students can brainstorm possible sources of information based on keywords extracted from a reading, listing maybe six or seven good choices in just a few minutes. This fluency works in tandem with the ability to identify search terms and build a query, resulting in sophisticated searches and a meaningful, deliberate “find, evaluate, and select” cycle. This fluency removes the randomness of the pre-selection process, meaning fewer students will produce source lists laden with material unsuited to their task or academic level, not because those publications aren’t producing articles on their topics, and not because there exists a blanket rule labeling some sources unfit for academic purposes. Savvy students won’t include them because these researchers have better options stored in their source banks, and if they do include sources that might, on the surface, seem inappropriate, there will be a justifiable purpose for doing so.

Students’ selections for use will be made using critical-reading and thinking skills, but their pre-selections will depend on their source literacy. It’s that fleeting moment when students’ eyes hit the screen displaying the search results that interests them and how that critical moment can be stretched into a longer one so that they can begin to look closely at the choices they are making. What will they pass over and what will they click on? So much tension exists in that question!

Source literacy is one piece of a huge puzzle, and it’s not something we talk about enough. No one thinks to teach the twelve-year-old what a frog is before the dissection begins because we all assume she knows.

But consider the fact that when I was teaching seventh grade in South Los Angeles, that dissection was the very first time some of my students had ever seen a frog up close and personal. They needed a minute to process what they were seeing, just to think about the fact that they were looking at a real frog. Similarly, our students need a minute just to think about what each source is—what it looks like, why it exists, how it’s named, how it’s constructed—before we ask them to open it up and dig in.

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Making a Literacy Plan

Developing an Integrated Curriculum that Meets Your School’s Needs

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Literacy doesn’t happen in a single lesson or course—no matter what ability you’re trying to develop. There are no shortcuts to gaining mastery over a skill set, whether it’s reading literacy, information literacy and research skills, online literacy and digital citizenship, or visual literacy. You have to be able to practice and apply the skills in different contexts, usually over the course of many years. School librarians’ unique role in literacy building is bringing a school together to work toward common goals and build student competence and mastery over time. Easier said than done.

School librarians dream about a perfect integrated curriculum: there’s ample time for collaboration and a library presence in every class; teachers, school librarians, and administrators work toward common goals in developing student skills; and students get individual support to reach the targets set out for them. Yet even the most resourced and highest functioning school libraries sometimes suffer from papers and projects with no skills collaboration, one-shot instruction with too much information crammed in and minimal assessment or follow-up, and weekly library or research classes with only surface-level classroom integration. We may have difficulty making coherent progress on one core literacy skill set, much less the myriad new literacies that we and our schools are excited to tackle.

This article outlines a six-step process that school librarians can use to start building focused, long-term student literacy in any given skill set. The preparation begins with identifying the essential skills that the school’s students need to work on, and then developing consensus and excitement around goals related to improving these essential skills. The process includes creating an action plan that makes the literacy goals present and visible within the school and figuring out where and how they fit into existing curriculum. And of course, there is plenty of on-the-ground planning, mapping, and reflecting with teachers about how to strengthen instruction and improve students’ skills.

Step 1: Be the leader.
Every new initiative needs someone who’s willing to lead. Being a leader could mean you’re owning the project by coming up with the initial plans and ideas and pushing for adoption, or it could mean you’re the convener, calling everyone to the table, helping to ask the right questions, and delegating tasks. How you choose to lead will depend on your time, strengths, and the school culture.

About five years ago, I started my very first school library job midyear at the school where I’m now the library director. I was fresh out of library school with almost no teaching experience and only hypothetical notions about how to develop curriculum. A couple months in, I was asked to present (at a meeting happening the next day) about how the school should be addressing information literacy in grades 5–12. I was lucky in two regards: an administrator had already selected a group of school stakeholders to participate in this...
initial meeting, and I didn’t have enough time to overthink or try to craft the perfect proposal. What I ended up presenting was essentially a modified version of Mike Eisenberg and Bob Berkowitz’s Big6 Skills, which later morphed into our school’s “Six Steps of the Research Process.”

I learned some incredibly important lessons from this first leadership experience. First, having teachers or department heads at the meeting from every discipline, including English, history, science, math, and foreign languages, was critical to building the interdisciplinary collaboration that would follow. Second, providing the group something to look at, a starting point—even if it underwent strenuous revision—helped everyone better understand what was possible. And lastly, I could successfully counterbalance my lack of seniority and experience with enthusiasm for the topic and a willingness to listen and build consensus.

**Step 2: Know what you can and can’t control.**

Once you have a plan, the next stage is to start figuring out how to implement it. It’s easy to come up with reasons why a new curriculum-development plan won’t work, particularly when you’re contending with already overscheduled teachers and curricula. Success at this stage requires focus on what you do have influence over within the school. For example, you probably have no influence over subject-level curriculum, frequency or existence of regular library classes, or teachers’ commitment to the skills identified. But you can articulate and share a vision for the literacy skills across grade levels and disciplines, alter the curriculum in library classes, and reach out to teachers in a more intentional way.

The biggest lesson I learned in my first year of building a new information-literacy curriculum was to focus on what I could do on my own without asking others to change for me. For example, I was able to create all new lesson plans for our weekly fifth- and sixth-grade library classes. This was exciting, even if thirty-five minutes was barely enough time to allow for students’ book selection and check out, plus, maybe, a book talk, never mind substantive skill development. The classes were such a success in the first year, however, that the middle-school director was open in year two to expanding the existing classes to forty-five minutes and even adding another half-year class in seventh grade.

**Step 3: Make the goals visible and generate excitement.**

If you want teachers and students at your school to work toward a common goal, they must understand the goal and be motivated to reach it. Every school will have different venues and methods for getting the message out. Make a list of your stakeholders and then brainstorm the best ways to reach each group.

During our first year with the new information-literacy initiative, the other librarians and I identified students, teachers, department chairs, and parents as the most important groups to get involved. We made professional-quality posters of our “Six Steps of the Research Process” for teachers to hang in their classrooms as a daily reminder of the skills. At the start of the school year in a full faculty meeting, we presented the process we went through to select the skills and develop the research process. We followed up by asking each chair if we could attend a department meeting to talk about what the school library could do for the teachers in his or her department. We reached out to parents by making presentations at parent coffees with school administrators.

**Step 4: Determine where the skills will fit.**

Now that everyone’s excited, it’s time to get practical. It’s your job as the librarian with a bird’s-eye view of the school to figure out where the skills are already being taught, where they could be easily added, and if there are holes in certain grade levels or disciplines. The goal here should be to build a big-picture view of how the skills could be taught so that everyone can see what’s happening across grades and departments.

When I began our curriculum development, I made a big grid for myself. Along one side I listed all of the skills that we had decided we wanted students to be learning and practicing, and at the top I listed each class. I began filling in the grid with what I already knew or could find out by reading the subject-level maps in our online curriculum-mapping software. I took this grid with me and showed it to each of the teachers and asked about any other projects or assignments in which the teacher incorporated research skills.

Meeting with every teacher was one of the most time-consuming but also rewarding things that I did during my first year of
developing our new information-literacy curriculum. Even the most reluctant teachers were willing to talk to me for twenty minutes. Every conversation sparked ideas for ways that we could work together. And at the end, I had an amazing product that was immensely helpful to every teacher at the school.

Step 5: Plan, plan, plan.
Creating a grid of where students were already learning—or could be learning—information-literacy skills helped give us a big-picture view of how courses could work together to build student understanding. Creating the grid also provided me with all the information I needed to create a literacy map for the grade level—one where student understanding could grow and build throughout the school year rather than happening in isolated pockets across the school. I used the literacy map to create a plan for how we could move students logically through learning all the skills during the course of the year without any one teacher or course shouldering the whole load.

Ninth grade at our school is a great example of how this collaborative planning worked. We started our information-literacy work in biology classes in October, teaching students about how to find, use, and cite databases and websites for their first lab. A week later, we went into history classes, first to talk about how to evaluate digital sources in conjunction with students’ first history project, and then to work on using background reading to develop topics and research questions. In November we brought these skills together in an English research paper and added instruction and practice with
I used the literacy map to create a plan for how we could move students logically through learning all the skills during the course of the year without any one teacher or course shouldering the whole load.

This work needs constant tending to keep alive. We were so excited about our ninth-grade success after the first year, but that summer we learned that the history classes would be getting a new textbook, and the English classes were going to have to cut their research paper. The news was a bit frustrating, but the mapped out plans we already had developed made it easier for us to come up with new ways that we could collaborate going forward.

Conclusion

Developing student mastery over any given set of skills takes years of intentional effort. So does the work of planning and implementing the instruction that will teach those skills. By the end of my fifth school year this June, our school will almost have an integrated information-literacy curriculum that spans grades K–10. We didn’t try to tackle every grade at once. We started with the big-picture structures and then slowly developed concrete plans and maps for a few grade levels each year. The biggest hurdle to getting our information-literacy curriculum off the ground may have been my own fears about not knowing where or how to start. What I learned is that you just have to dive in. It’s overwhelming to take that first step, but you’ll be glad you did.

Step 6: Assess, rinse, repeat.

The end of the year is a time to celebrate and reflect. Map out what you and the teachers in each grade accomplished during the year, as well as anything you intended to work on together and didn’t. Share this information with teachers and talk about what you want to do again next year and what you would change or add. At the start of the next school year, contact teachers again with a reminder about the plan and offer to help in the commitments you all made together.

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Building Success beyond High School with Career- and College-Ready Literacies
School librarians make it a priority to create an environment in which students feel safe, welcome, and supported. We can help students take that feeling of safety and security with them as they move into adult spaces, including university and public libraries. Many of our students’ future interactions with libraries will take place primarily through digital tools, which school librarians are well positioned to teach students to use. Helping students gain basic knowledge about what is available to them at libraries beyond high school, develop skills with using the library itself (including self-efficacy), and learn about building a professional presence online for job hunting and career work are all ways in which school librarians can effectively support students in transition to their post-secondary lives.

When we speak of literacies our students need, how do college-ready and life-ready literacies fit into that puzzle? Too often high schools send graduates into the world without practical tools that will help them to be successful. With the college freshman retention rate at only 64 percent on average (for public universities) and much lower for students of color or low-income students (ACT 2015), how can school librarians provide interventions that help the other third of our students make their transitions more successful? The Partnership for 21st Century Learning’s P21 Framework identifies two areas for student outcomes that relate to our work in school libraries: Information Media/Technology Skills and Life and Career Skills (Partnership for 21st Century Learning n.d.).

Students need help specifically in:

1. Understanding post-secondary digital resources and tools
2. Engaging in self-efficacy when needing help
3. Creating academic digital archives or portfolios
4. Creating appropriate digital social self-representation

In their research on library anxiety, a concept first identified by University of North Carolina’s Constance Mellon (1986), researchers Qun G. Jiao and Anthony J. Onwuegbuzie identify areas that are stressful for students and for which students are most at risk. Issues that Jiao and Onwuegbuzie particularly identified are:

(1) barriers with staff (the perception that librarians and other library staff are intimidating and unapproachable); (2) affective barriers (feelings of inadequacy about using the library); (3) comfort with the library (how safe, welcoming, and non-threatening students perceive the library to be); (4) knowledge of the library (how familiar with the library students feel they are); and (5) mechanical barriers (feelings which emerge as a result of reliance on mechanical library equipment). (Jiao and Onwuegbuzie 1995)

Their research makes it clear that library anxiety impedes college students’ research tasks because it interferes with the more-mechanical tasks of using the library or research tools effectively. Furthermore, they found that this anxiety impacts a large percentage of students, particularly non-native English speakers, males, and high-achieving students.
Literacy specialist and author Renee Hobbs (2010) has identified “access” as a key competency for literacy; high school librarians can help ease this anxiety with a variety of strategies. One way to do this is to offer students practice with university or public library websites. During the last week of school, for example, I typically work with senior English classes to provide a tour of college library websites. University and public libraries offer a variety of services that students aren’t accustomed to accessing in high school, including texting and live chats with a librarian, webinars, subject-area librarians, subject-area guides, study room reservations, and more. We practice locating helpful resources on college sites, chat live with a librarian to show how easy it is, locate links to subject-area librarians, and learn how they can help. We look at databases and how to use subject guides to determine which databases are appropriate for their majors. We explore the look and feel of LibGuides. Universal search is another feature they might not be familiar with, so we explore how that works as well. Finally, we look at tools university libraries have provided on their site for independent learning, like webinars, pathfinders, etc.

At Madison College in Madison, Wisconsin, which is for many students a stepping stone to University of Wisconsin schools, information literacy coordinator Matthew Coan notes: “We librarians at Madison College spend countless hours creating online research guides for students. We also have many online tutorials. (My job is to maintain and update them.) Quite often, however, students don’t seek these out unless we first ask them or require them to do so” (2015).

In discussions with our Professional Learning Community groups for twelfth-grade instructors, I’ve discovered that English teachers at the high school level are mostly unfamiliar with the offerings and navigation of current university library sites. So this year, to expand student support, we are planning (at the time of this writing) more-routine spring semester opportunities for students to engage with university-level pathfinders. For example, for their study of Hamlet we might use Rice University’s Shakespeare pathfinder. We have identified areas where students need help so we can weave strategies into their spring semester assignments, such as how to use synonyms in searching, how to use universal search, and helping students engage in self-efficacy by using “chat with a librarian” services.

Similarly, seniors who don’t plan to go to college immediately after high school can benefit from guided practice in using public library websites, specifically sections that are dedicated to career support. This practice would help students build confidence and familiarity with public libraries and their resources.

School librarians serving K–12 students need to be sure their own websites are stepping stones to using the sorts of information and resources offered on university and public library websites. Even in high school, library websites are often not on students’ radar, so finding opportunities and methods for engaging students with them is important. When building pathfinders or LibGuides for students, for example, why not include links to the local university’s or local public library’s pertinent resources? Consider having students build pathfinders themselves so they internalize the value of these resources. When the school library doesn’t have a book, refer the student to a nearby public library or university, and use the other institution’s website to look up what is available so that students see libraries as connected entities.

Another way to combat library anxiety is to empower students to ask for assistance, building the P21 skills of initiative and self-direction. Jiao and Onwuegbuzie’s research found

**Similarly, seniors who don’t plan to go to college immediately after high school can benefit from guided practice in using public library websites, specifically sections that are dedicated to career support.**
that high-performing students and non-native speakers both assume that other students know what to do better than they do and feel embarrassed asking for help (1995).

And, as librarian Coan points out, "Even if they want to ask for help during an info lit session, there are logistical hurdles. Only one of me and, perhaps, twenty-two or more of them...most of the time they’ll probably have to come back and see us at the reference desk, which is also intimidating." For students from lower-income backgrounds or for non-native speakers, particularly, any activities that empower students to ask for help, that build resiliency in seeking information, and teach them that librarians are trusted professionals are beneficial.

Students need help with other digital career- and college-readiness skills as well—what British technology nonprofit Jisc calls "career and identity management" literacies (2015). As Austin Community College teaching adjunct William Martin told me, we assume students who are online have digital skills, but they are not necessarily practical or professional ones (2015).

There are simple tasks that school librarians can teach students, like setting up appropriately named e-mail accounts for job hunting. The informal or slang e-mail account names that students might have found entertaining to use with their friends might not be appropriate for their college application or job hunting process. Helping students establish a professional digital presence, whether via a resume site, a LinkedIn profile, or an About.me page is another way to prepare students for job hunting and a more academic presence online. At our campus at Westlake High School, ed tech Lisa Johnson works with every senior class to transition their work into online portfolios they can access after high school. She shows students how to migrate documents or set up portfolio sites of their own to store their work, using sites like Bulb <bulbapp.com> or Google Sites and Google Docs.

This intentional transitioning for students provides them guidance in a structured way, rather than leaving the transition to chance; this assistance is especially important for students who don’t have family support after high school. School librarians can play a similar role, helping students migrate important projects that represent their academic work onto portfolio sites, blogs, etc. We can help curate portfolio options for students and team with teachers or counselors and ed tech staff to systematically help students with transitioning their work to an online profile.

In accordance with digital citizenship training, school librarians can talk to students about appropriate use of social media accounts as they move into college or careers or show them how to create alternate accounts for professional
work. In fact, students are already unconsciously sorting their online identities. In her book *It's Complicated*, danah boyd documents the fact that students adjust their “identities” to match the social media tool they are using, reserving some tools for interacting with family, while using others for school friends.

When secondary librarians teach students these digital life literacies, they help students perceive that librarians can provide support for real-life problems. Since Jiao’s research identified “affection” tone of librarians as a barrier, the more we work with students, create inviting library environments, and have positive engagements with students, the more we change their perceptions of librarians in general. School librarians play a significant role in creating life-long library users and supporters, and our role as a vital link in the career-ready/college-ready chain is a significant but often overlooked one. Working with high school teachers to create a plan for transitioning students will help alleviate barriers to their success for years to come (Jiao, Onwuegbuzie, and Daley 1997).

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DESIGN THINKING and the SCHOOL LIBRARY

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This past school year, I set out to develop lessons that incorporated the design thinking process into my literature exploration curriculum in the school library. Design thinking is a term that I have heard many times over the past few years in the context of education. Design thinking has been incorporated into the school environment as a way to devise more-effective professional development and class schedules, and student-centered classroom spaces. I have been involved in using the design thinking process for all of these purposes, and the more I learned about the process the more interested I became in using design thinking with my students. Could the benefits of the design thinking process be translated to the classroom environment, resulting in a deeper involvement of students in the learning process, more-engaged students, and more-effective long-term learning? I explored this process with my first-grade students.

What Is Design Thinking?
In developing the lesson and the outcomes for this project the first step was understanding the design thinking process, its history and background, and the aspects of the process that could be adapted for younger students. As an evolution of the research and development process, design thinking has been around for decades in the design and business world. What makes design thinking a fresh idea now is the recent focus on human-centered design. Tim Brown, President and CEO of IDEO, described design thinking as:

“a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos. By this I mean that innovation is powered by a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made, packaged, marketed, sold and supported.” (Brown 2008, 86)

The design thinking process was developed and used as a way to develop better products and services that focused on the needs of the end user. Human-centered design involves observation and development of a deep understanding of how people use a product and interact with it, and the role the product plays in their lives.

Design thinking has been used not only in for-profit product development but also by non-profit groups as a way to find solutions for social issues. Design thinking has been used by organizations and groups around the world to help better understand the needs of populations in all aspects of social justice issues, from healthcare to clean water. The cornerstone of design thinking is empathy; when the designer better understands the day-to-day needs of a group of people, the design of a solution will better fit the needs of those people for whom the solution is intended.
As the principles of design thinking moved from the traditional business research and development arena to the area of social justice, the principles also began to make inroads in education. Schools started to see the benefit of using the design thinking process in the redesign of educational spaces, professional development, and curriculum to find methods of making experiences better for students and teachers. IDEO released the free downloadable Design Thinking for Educators toolkit and website to offer guidance on the use of the process in the education field. An example of a district that benefitted from applying design thinking was the Howard County (MD) Public School System, where the process was used to reevaluate their paper-based curriculum. The district wanted to implement student-centered curriculum delivery, as noted in the following statement.

“Tapping into teacher, parent, and student behaviors in and outside of school, the design team collected inspiration around the ways that people engage with information and interact with curricular materials. Understanding the desires of teachers, students, parents, and administrators has helped the team rethink curriculum delivery as well as develop resources to replace, augment, and enhance current curriculum documents.” (IDEO n.d.)

Elements of the Design Thinking Process

The design thinking process, no matter what the arena, requires empathy, optimism, experimentalism, and collaboration.

As design team members work on a human-centered design project, their exploration of the needs and perspectives of the end user result in their feeling empathy, allowing the designers to see the world from multiple perspectives and create a design that works best for the end user.

Optimism is the mood of the team. No challenge is too big, and a solution can always be found to create a better product, overcome a challenge, meet a need, or design a space.

Design thinkers are experimentalists, who are constantly asking questions and looking for creative solutions to problems, rethinking and reworking ideas.

Collaboration is also key to design thinking. Design thinkers working together are open to the ideas and suggestions of their team members and also seek input and information from a variety of experts, including those outside the field of study for which the team is designing.

Steps of the Design Thinking Process

The Institute of Design at Stanford University (a.k.a., the d School) lists five steps in the design thinking process.

Step one is to understand or empathize. In this step the design team focuses on observing and interviewing their subjects and learning as much as possible about their audience. The team will be looking to answer questions such as “Who is the user?” and “What matters to this person?”

Step two is to define the issue and the needs of the user. What is the audience’s point of view and what are the needs of the end user?

Step three is the ideate stage. The teambrainstorms as many creative solutions as possible. “Crazy ideas” are encouraged!

Step four is the prototype stage. This stage involves creating or building a rough representation of one or more ideas to show to the end user.

Step five is to test the product, sharing ideas and prototypes with end users and a larger audience to garner feedback.

The iterative process would then continue with reworking and adjusting the product as the design team receives feedback from end users. The process can take weeks, months, or even years as the design team works to create the best product or service (Hasso Plattner Institute of Design n.d.).

At my school we engaged first-graders in this design thinking process.

The cornerstone of design thinking is empathy; when the designer better understands the day-to-day needs of a group of people, the design of a solution will better fit the needs of those people for whom the solution is intended.
Design a Better House for the Three Little Pigs

**Overview**

The focus of the first-grade design thinking challenge was to gain a deep understanding of the elements of The Three Little Pigs story and to design a better house for the pigs. My goal was to have students look more deeply than usual at the characters, setting, problem, and solution in the story so that they would better understand how all of these elements interact and depend on each other to make an engaging and interesting story. I hoped that, as students looked more closely at the elements of this story while reading, they would develop an awareness that they could transfer to their own writing.

I chose *The Three Little Pigs* as the theme because most children are familiar with the story, and multiple versions of the story are available for students to read and study. This familiarity allowed students to begin with some basic understanding of the tale as they delved deeper into the story and maintained their interest as we read different versions.

Students focused on understanding the problems the three little pigs faced in the story and then found solutions for those problems. Students prototyped their ideas and then shared them with their classmates and the larger school community.

**Step 1: Understand**

The first stage of the design thinking process is empathizing. For the first-grade lesson I used the word “understand” during this stage, a word more easily understood by first-graders than “empathize.” I discussed with the students what the process was going to be and why we were going to look closely at the story and, through the story, try to understand the lives of the three little pigs. I framed empathy and understanding as learning what was happening in the story so we could better understand what was happening with our subjects. I read *The Three Little Pigs* by Paul Galdone (HMH Books for Young Readers 1984). Galdone’s is a traditional version of the story in which the pigs build their houses out of straw, sticks, and bricks. The first two pigs are eaten after the wolf huffs and puffs and blows their houses down. The third little pig builds his house out of bricks and tricks the wolf into climbing down the chimney where the pig has waiting a pot of boiling water. The wolf is cooked and eaten for supper.

After I read this version, students identified the characters, three little pigs and a wolf; and the setting, a farming area or a small wooded area in the country. Students identified two problems: first, the wolf wanted to eat the pigs, and second, two little pigs did not build houses strong enough to keep the wolf out, resulting in their being eaten. Students identified two solutions to avoid being eaten. The first was the third little pig’s choice to build his house out of bricks, and the second was to eliminate the future threat of the wolf by tricking the wolf down the chimney and into the boiling pot of water.

**Step 2: Observe**

The second stage of the design thinking process is the define stage in which the team members “redefine and focus insights” based on what was learned in the empathy stage (Mark Wolfe Design 2013). For this project, I redefined this stage as the observe stage. I wanted students to have another opportunity to think about how the elements of a story intertwine with each other. At this point, students looked at the setting.

We read *The Three Little Javelinas* by Susan Lowell (Cooper Square 1992). This version of the story is set in the American Southwest desert; the three little pigs are javelinas (peccaries). After reading the story students discussed how the setting of the story changed other elements of the story. Not only are the characters different from the domestic pigs in the traditional version but also the materials used to build their houses: tumbleweeds, dried cactus ribs, and adobe bricks. The antagonist of the story is a coyote instead of a wolf.

In groups students brainstormed about how the characters, problems, and solutions might vary if the setting of the story changed again. This exercise’s goal was to deepen learners’ understanding about ways the setting of the story affected the other elements of the story. Each group was given a different setting: ocean, mountains, city, rainforest, and swamp. The groups brainstormed not only new characters but also new materials that could be used, types of houses that could be built, and what the ending might be based on the new setting. Ideas included a fish and a shark for characters, and sea grass and coral for the ocean setting.

The city setting inspired cats and dogs as characters using newspaper, cardboard, and traditional construction materials for the houses. Students shared their ideas and their reasoning with their classmates.

**Step 3: Define**

During the next step, the define stage, students were asked to focus on the character traits of the pigs.
taking a deeper look at both the positive and negative traits of the pigs. During this stage, we read *The Three Ninja Pigs* by Corey Rosen Schwartz (Putnam 2012). This version focuses on the personalities of the characters more than do the versions we read previously. After reading the story, students brainstormed and shared words to describe the good qualities of each pig’s personality and identified qualities of each pig that worked against them as they built their houses and tried to defeat the wolf.

Students then brainstormed ideas about the materials that the pigs used in the different stories. What were good qualities of the lighter materials and the stronger ones? What were negative aspects of building with the various materials? As they answered these questions students dug deeper into the character traits of the pigs and also developed a deeper understanding of the problems the pigs were facing. As a result, empathy for the characters increased. Students were ready to move on to the next brainstorming step and take the project to the next level of learning.

**Step 4: Ideate**

Students then moved into the ideate stage of the design thinking process. This is the brainstorming stage where any and all ideas are welcome, no matter how crazy, unusual, or far-fetched they may seem. The objective is to get all of the ideas out. Even the most outrageous ideas may contain a nugget of possibility that can lead to a solution (Hasso Plattner Institute of Design n.d.).

For this stage of the process, we worked as a large group. Students shared ideas, wrote them on sticky notes, and added them to the board. The ideas ranged from the simple, such as offering the wolf something else to eat, to the more complex ideas of titanium houses with elaborate laser security systems. Students focused on the things we had learned in the “define” stage to keep them focused on the task of creating a solution for the pigs. As we went through the process, we filled the board with notes.

Next, working as a class, we grouped the ideas into categories and saw a number of larger themes emerge. The themes included: guards, traps and mazes, tricks and decoys, lasers, and security. First-graders also came up with some ideas that focused on social justice issues, including finding another food source for the wolf. They thought that if the wolf had something else to eat, he would leave the pigs alone. Another idea was friendship. If the pigs found a way to be friends with the wolf, then he wouldn’t eat them because, as one of my students said, “You just don’t eat your friends.” The final theme was education. If the first two pigs had more education on better ways to build houses they would have had better results.

Students grouped themselves based on the solution on which they wanted to focus, such as security, friendship, or alternate food sources. The final step of the ideate stage was to sketch a design of the house each group would build. Students focused on the themes we had determined and drew pictures of their ideas. They then shared those ideas with the rest of the class. Students again broke into small groups to plan the next stage of prototyping.

**Step 5: Prototype**

The prototype stage is the building step of the design thinking process. During this stage, members of the team use a variety of materials to create a representation of their design idea. The prototype stage in our project allowed the students’ solution-based groups to create and build models of their houses for the three little pigs. For my students, this step focused not only on being creative with the use of materials as they built models of what they had visualized but also on improving their teamwork and collaboration skills. During this step, each group had to make a plan, decide the characteristics on which to focus while building, work together to decide who was going to build each element, and compromise and understand that this was a team challenge.

Students began with a team meeting to map out what they were going to create. The next step was the building process. Spread out in the room were a large collection of building materials, including boxes, construction paper, stuffing, fabric, pipe cleaners, glue sticks, tape, etc. Students collected materials and started building, using resources creatively as they focused on the end users, the pigs.

Students spent two classes building in the library. Each session was approximately an hour long; students were engaged and involved during the entire process. Other than a few minor disagreements that needed adult intervention, students worked within their groups to resolve conflict. Every student was able to contribute to the building process.

**Step 6: Share**

The final step of the design thinking process is the test stage. Traditionally, in this step, members of the design team return to the original end users they had interviewed earlier, and share the prototype and receive feedback. Then the group makes
alterations and adjustments based on user feedback. For *The Three Little Pigs* project I called the final step the “share” step. Given that our user group consisted of fictional characters, the final step was revised to involve the groups’ sharing their final projects with their classmates.

Each group made a video explaining the design decisions made as its house was planned and built. The videos were shared at an all-school assembly, and the models were displayed in the school. During the sharing process students answered questions about their projects, shared thoughts about their houses, and listened to feedback about their designs. During the all-school share students extended their projects to an authentic audience, taking the assignment outside the classroom to share beyond their peer group and present to a large group of students, teachers, administrators, and staff.

**AASL’s Learning Standards and Design Thinking**

The design thinking process meets many of AASL’s *Standards for the 21st-Century Learner* (AASL 2007).

Throughout the steps students were asked to retell and remember the key points of the story as they engaged in the process (Standard 1.1.7: “Make sense of information gathered from diverse sources…”).

First-graders were asked to collaborate at all stages of the process from sharing information and brainstorming ideas about the story as a class to designing and building in a small team (Standard 2.1.5: "Collaborate with others to exchange ideas, develop new understandings, make decisions, and solve problems"). Throughout the design thinking process students were asked to share their ideas and listen to others.

Our first-graders also were asked to provide feedback to classmates about their ideas and plans, and listen to and accept feedback on their own ideas (Standard 3: “Share knowledge and participate ethically and productively as members of our democratic society”).

Because they were asked to delve deeper into the story, students developed a deeper understanding about how the elements of a story—including characters, setting, problem, and solutions—are connected. Students also developed empathy for characters in the story and made strong connections by focusing on the needs of others (Standard 4.1.3: “Respond to literature and creative expressions of ideas in various formats and genres”). In the process, they expressed feelings about characters and events in the story, made connections between literature and their own experiences, and identified plot, characters, times, and places in the story.

**Reflection**

This project took place over twelve weeks as students made their once-a-week forty-minute visits to the school library. From week to week students were ready and able to engage in the process. They recalled where we were in each stage of the project and quickly reconnected to the themes. When we used the design thinking process to dissect the elements of the story, first-grade students were able to make deeper connections to what we were reading than they did in a single story session.

This project contributed to students’ deeper understanding of stories that were read in the classroom and writing projects in which they engaged through their Writer’s Workshop curriculum in the classroom.

This project also introduced students to terms that they will hear and be expected to identify in literature as they advance in school. Terms included: characterization, point of view, retellings, perspective, and the connection between all the elements of the story.

Students also spent time thinking about a situation from a different perspective and gaining empathy and understanding for the three little pigs and the big bad wolf. Developing empathy is an important component in our development as members of human society; fostering empathy is an essential part of our role as educators of young children.

First-grade teacher Tisha Johnson said this about *The Three Little Pigs* project:

> Not only did the children enjoy listening to several versions of the story (they were especially drawn to the newer version on the Ninja Pigs since Ninjas are a hot topic in my classroom right now), but the project pulled them in a way that I have never seen first-graders engaged in library classes before. The children were taught and followed the design

> When we used the design thinking process to dissect the elements of the story, first-grade students were able to make deeper connections to what we were reading than they did in a single story session.
thinking process to create the ultimate home to save the pigs. They were truly invested in working with their peers to work through every idea that was offered in their group. During this project there was laughter, contemplation, problem solving, negotiation, testing, failing and testing again, joy, and pride.

Challenges included the limited library time scheduled for each class. Although students were engaged in the process spread out over twelve weeks, students might have felt that the whole project was more connected had they been able to work in the library more frequently. As I move forward with extended projects like this one, I hope to encourage the school administration and teachers to support the change to a fixed/flex schedule allowing for an increased connectivity within a project and between the library and the classroom.

The key to success for design thinking projects like this one is collaboration among students and among educators. The best way for deeper learning and questioning skills to be developed is through lessons school librarians coplan with classroom teachers and subject specialists. The result can be in-depth learning for all students regardless of their ages.

The Three Little Pigs project was a model for a 21st-century methodology that incorporates project-based learning and design thinking with young learners, as students were provided with a clear problem to address and the tools to solve the problem using a clear process. I look forward to using design thinking with more students and classes as we explore literature and other research topics in the school library.

Works Cited:
I take issue with how early some people are pulling their kids away from picture books.

Recently, my son came home with a packet dealing with questions on basic grammar. Basic to you and me, but not to someone first learning it. Like most people learning something new, he quickly became frustrated with the first task: “Underline the predicate in the sentence.”

My son did not know what a predicate is, so he did what any kid would do: he underlined everything. This was my chance to further his belief that I was the smartest man on the planet, a belief I knew wasn’t going to last much longer, so I needed to grab every moment I could. I said to him, “The predicate is what the subject is doing.” He looked at me like I had three heads. I definitely lost a few points on the smart scale in his eyes, and if I didn’t come up with something quickly I would lose my imaginary ranking altogether. As he erased I sat thinking. Then it struck me. Somewhere locked in a memory cell, deep in my brain waiting to be accessed, was a song from my childhood, which I sang to him:

This is the tale of Mister Morton
Mister Morton is who?
He is the subject of our tale
and the predicate tells what
Mister Morton must do.

Mister Morton walked down the street;
Mister Morton walked.
(Ahrens 1993)

In that instant I could tell just by looking at him that he got it—only to be confirmed when he said, “So ‘walked’ is the predicate because it’s telling him what to do.” Smartest Man in the World ranking saved!

For the rest of the packet, whenever he got stuck on something I had a Schoolhouse Rock! song to explain it. Now please understand, I do not watch old Schoolhouse Rock! videos. For some reason these songs were burned into my brain from back when I was a kid watching Saturday morning cartoons. I would like to think I have an incredible memory, but that is not the case. However, if you ask me to sing a song from an old TV show or commercial from the time I was my son’s age, chances
are I could do it. But why? Why is it I can’t remember someone’s name but I can remember:

I put a dime in the drugstore record machine. Oldie goldies started playin’ if you know what I mean. I heard Chubby Checker, he was doin’ the Twist, The Beatles and the Monkees, it goes like this! I put a dime in the drugstore record machine. (Ahrens 1973)

That was a verse of “A Noun Is a Person, Place, or Thing” from Schoolhouse Rock!, which I heard in the 70s.

I have only a theory as to why I can remember this; I have no scientific proof. This theory is based on my own years of experience: forgetting complex equations in Analytical Chemistry class, but being able to sing the entire theme song for the Star Blazers TV series. I think this phenomenon has to do with the way people learn. Some people learn facts through visual learning, others through audio. When you mix facts with song you are doing both. Twice the learning power, twice the chance of remembering. Schoolhouse Rock! is a perfect example of this. For example:

So when you’re happy (Hurray!) or sad (Aw!) Or frightened (Eeeeeeek!) or mad (Rats!) Or excited (Wow!) or glad (Hey!) An interjection starts a sentence right. (Ahrens 1974)

Each one of those phrases is accompanied by a picture to show how an interjection is being used. That’s your visual. Toss in a catchy tune, and you have your audio. Mix the two together and you have a mixed-media extravaganza!

“Hey you got my pictures in your song! Hey you got my song in your pictures!” It’s the Reese’s Peanut Butter Cup of learning. But I’m sure you’re wondering, “What does Schoolhouse Rock! have to do with children’s literature?” Well, something out there in children’s literature follows a similar teaching style: picture books.
I know, readers don’t necessarily sing along to a picture book, so where is the mixed media? It’s in the pictures. You see, picture books are sneakier than Schoolhouse Rock! When an author writes a picture book, there has to be a marriage between the pictures and the words. The pictures tell just as much of the story as the words do, and this is where the sneaky part comes in. As a writer I can introduce wonderful language and new vocabulary to kids without having to explain the words because the pictures will do that for me. A child can listen to a picture book being read and not know what a word means, but be able to figure it out by looking at the corresponding illustration. Now, not only will the child hear the word but also have a picture to go along with the definition. It’s two great tastes that are even better together, just like peanut butter and chocolate! Don’t think of a picture book as a way to put your kids to sleep at night; think of it as a powerful mixed-media learning tool. 

I take issue with how early some people are pulling their kids away from picture books. Parents sometimes get this attitude that makes them say, “My five-year-old is reading chapter books so why do I need picture books?” I think it’s great that kids are reading chapter books at such a young age, but do not get fooled into thinking that these kids are too old for picture books. Great language and vocabulary acquisition are specific to the picture book and simply not found in chapter books. That’s why a picture book is read to a child and a chapter book or easy reader is read by a child. When parents stop reading picture books to their kids too early, children miss out not only on developing a stronger vocabulary, but also on the beautiful artwork that will help them learn new Monstrous Words (see <http://mightymediapress.com/monster>). 

Who knows? Maybe someday your kid will be sitting in front of the SATs, racking their brain on an analogy. Then the image of their favorite picture book pops into their head, giving them the correct answer. Maybe your kid gets into Harvard and graduates as valedictorian, all because of a book about a giant blue monster. You’re welcome.

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Paul Czajak got an F, accompanied by the words “get a tutor,” on his college writing paper, and, after that, he never thought he’d become a writer. But after spending twenty years as a chemist, he knew his creativity could no longer be contained. Paul lives in New Jersey with his wife and two little monsters. In addition to the Monster & Me™ series, he’s also the author of Seaver the Weaver, a contributor to Huffington Post, and a reviewer for New York Journal of Books.

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Work Cited:

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Statement of Ownership and Management
Knowledge Quest, Publication No. 485–860, is published five times per year by the American Association of School Librarians, American Library Association, 50 E. Huron St., Chicago, IL 60611-2795. Annual subscription price, $50. Printed in U.S.A. with periodical class postage paid at (Illinois). As a nonprofit organization authorized to mail at special rates (DMM Section 424.12 only), the purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes have not changed during the preceding twelve months. 

Extent and Nature of Circulation
(“Average” figures denote the average number of copies printed each issue during the preceding twelve months; “actual” figures denote actual number of copies of single issue published nearest to filing date: September/October 2015 issue). Total number of copies printed average 7,798; actual 8,175. Sales through dealers, carriers, street vendors, and counter sales: none. Mail subscription: actual 6,631. Free distribution actual 294. Total distribution average 7,798; actual 8,175. Office use, leftover, unaccounted, spoiled after printing average 614; actual 1,250. Total: average/actual 7,798/8,175. Percentage paid: average 95.7; actual 95.7.